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ANNEX TWO (31474/SAA2-403420-2)
BETWEEN
THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
AMES RESEARCH CENTER
AND UBER TECHNOLOGIES INC.
UNDER SPACE ACT UMBRELLA AGREEMENT
NO. 27889, DATED 5/4/2018.

ARTICLE 1. PURPOSE

This Annex Two (31474/SAA2-403420-2) (this "Annex") shall be for the purpose of addressing the emerging need for technologies that will allow for the operation of unmanned aircraft by a small crew of individuals from a remote network operations center. That is, Multiple operators supervising an increasing Number of vehicles (M:N). This will require a new control/supervisory paradigm where the supervisors team up with automation to achieve their joint tasks, Human Autonomy Teaming (HAT). The efforts in this Annex will follow the HAT philosophy and tenets (e.g., trust, bi-directional communication, and pilot directed interfaces). The Parties will also develop and employ specific HAT tools (e.g., operator supervisory delegation techniques, working agreements, predictive timeline displays, and transparent interfaces to build trust).

Under this partnership, NASA Ames Research Center (NASA) and Uber Technologies Inc. (Uber or Partner, together with NASA, the Parties) will work together to define the operational environment, constraints, concept of operations (CONOPS), and the roles and responsibilities of remote supervisory operations. Together the Parties will define the best way to support this joint task including the appropriate information, interface, and Artificial Intelligence (AI) techniques. Concepts will be represented in simulation, tested, refined and ultimately evaluated in flight test. The tools and techniques will initially be developed and tested in the context of small Unmanned Aircraft System (UAS) delivery, then refined and applied to Urban Air Mobility (UAM), both cargo and air-taxi.

The legal authority for this Annex, consistent with the Umbrella Agreement, is the National Aeronautics and Space Act (51 U.S.C. § 20113(e)).

Capitalized terms used herein and not otherwise defined are defined as set forth in the Space Act Umbrella Agreement No. 27889, dated May 4, 2018.

ARTICLE 2. RESPONSIBILITIES

A. NASA ARC will use reasonable efforts to:

1. Adapt simulation capabilities for joint task, supervisory/control applications; e.g., low altitude traffic, Visual Flight Rules (VFR), UAS Traffic Management (UTM) system, UTM-like corridors, and small UAS models.
2. Develop HAT tools to apply to this use-case: supervisory delegation techniques, working agreements, and predictive timeline displays.

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3. Design supervisory interface to support new task and embody HAT principles: transparency, communication, and human-centered.
4. Conduct two human-in-the-loop (HITL) simulations, including training, integration, and testing.

B. Partner will use reasonable efforts to:

1. Develop a detailed CONOPS, including operational description, airspace use, air traffic control (ATC) coordination, aircraft performance, obstacle and hazards and avoidance, detect and avoid.
2. Define roles and responsibilities of remote supervisor, ATC, Partner, UAS Service Supplier (USS), UTM and other stakeholders.
3. Design supervisory interface to support new task and embody HAT principles: transparency, communication, and human-centered.
4. Prepare data analysis and report; conduct and provide stakeholder review and feedback.
5. Participate, including providing content, routes, and contingencies, in two human-in-the-loop (HITL) simulations.

ARTICLE 3. SCHEDULE AND MILESTONES

The planned major milestones for the activities for this Annex defined in the "Responsibilities" Article are as follows:

1. Conduct kick-off meeting for collaboration. (Joint)	1 month after Effective Date
2. Develop detailed CONOPS. (Uber)	3 months after Effective Date
3. Provide technical forecast of autonomous systems. (Uber)	5 months after Effective Date
4. Finalize roles and responsibilities (including operator, fleet manager, USS, automation. (Joint)	6 months after Effective Date
5. Complete interface design for Simulation 1. (Joint)	9 months after Effective Date
6. Complete development of HAT tools for simulation. (NASA)	12 months after Effective Date
7. Finish Simulator build-up. (NASA)	15 months after Effective Date

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8. Execute Simulation 1. (Joint)	18 months after Effective Date
9. Prepare data analysis/report. (Joint)	24 months after Effective Date
10. Provide stakeholder review and feedback. (Uber)	25 months after Effective Date
11. Complete revised simulation design for Simulation 2. (Joint)	27 months after Effective Date
12. Provide Simulation modifications. (NASA)	30 months after Effective Date
13. Execute Simulation 2. (Joint)	33 months after Effective Date
14. Finalize data analysis and report. (Joint)	35 months after Effective Date
15. Final report completed. (Joint)	36 months after Effective Date

ARTICLE 4. FINANCIAL OBLIGATIONS

There will be no transfer of funds between the Parties under this Agreement and each Party will fund its own participation. All activities under or pursuant to this Agreement are subject to the availability of funds, and no provision of this Agreement shall be interpreted to require obligation or payment of funds in violation of the Anti-Deficiency Act, (31 U.S.C. § 1341).

ARTICLE 5. INTELLECTUAL PROPERTY RIGHTS - DATA RIGHTS

A. Data produced under this Annex which is subject to paragraph C. of the Intellectual Property Rights - Data Rights Article of the Umbrella Agreement will be protected for the period of two years.

B. Under paragraph H. of the Intellectual Property Rights - Data Rights Article of the Umbrella Agreement, Disclosing Party provides the following Data to Receiving Party.

The lists below may not be comprehensive, are subject to change, and do not supersede any restrictive notice on the Data provided.

1. Background Data:

None.

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2. Third Party Proprietary Data:

None.

3. Controlled Government Data:

None.

4. The following software and related Data will be provided to Partner under a separate Software Usage Agreement:

None

ARTICLE 6. TERM OF ANNEX

This Annex becomes effective upon the date of the last signature below ("Effective Date") and shall remain in effect until the completion of all obligations of both Parties hereto, or three years from the Effective Date, whichever comes first, unless such term exceeds the duration of the Umbrella Agreement. The term of this Annex shall not exceed the term of the Umbrella Agreement. The Annex automatically expires upon the expiration of the Umbrella Agreement.

ARTICLE 7. RIGHT TO TERMINATE

Either Party may unilaterally terminate this Annex by providing thirty (30) calendar days written notice to the other Party.

ARTICLE 8. POINTS OF CONTACT

The following personnel are designated as the Points of Contact between the Parties in the performance of this Annex.

Management Points of Contact

NASA Ames Research Center

Michael M. Rogers
Project Manager
Transformational Tools and Technology
Mail Stop: N258-2
Moffett Field, CA 94035
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michael.m.rogers@nasa.gov

Brenden Sanborn
Agreements Manager

Uber Technologies Inc

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Human Factors Engineer
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Mail Stop: N223-1
Moffett Field, CA 94035
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Technical Points of Contact

NASA Ames Research Center
Robert J. Shively, Ph.D.
Manager, Human Autonomy Teaming Lab
Mail Suite: 262-2
Moffett Field, CA 94035
Phone: 650.604.6249
robert.j.shively@nasa.gov

ARTICLE 9. MODIFICATIONS

Any modification to this Annex shall be executed, in writing, and signed by an authorized representative of NASA and the Partner. Modification of an Annex does not modify the terms of the Umbrella Agreement.

ARTICLE 10. SIGNATORY AUTHORITY

The signatories to this Annex covenant and warrant that they have authority to execute this Annex. By signing below, the undersigned agrees to the above terms and conditions.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION AMES RESEARCH CENTER

BY: _____
Huy K. Tran, Ph.D.
Director of Aeronautics

DATE: 2/3/2020

UBER TECHNOLOGIES INC.

BY: Tom Prevot
Tom Prevot, Ph.D.
Director of Airspace Systems

DATE: January 27, 2020